

29th. Illinois.—Fairmont, Vermillion Co.: a tornado passed near this place in the afternoon, destroying crops, uprooting trees, etc.; its path was about two hundred yards wide.

30th. Minnesota.—Saint Paul: a severe thunder-storm, accompanied by heavy rain, occurred between 10.08 and 10.15 a. m., maximum velocity of wind fifty-six miles per hour from the west; two barges on the river were sunk, and trees and chimneys were blown down. Telephone instruments were much injured by lightning.

31st. Pennsylvania.—Houser Mill, Monroe Co.: a tornado occurred here about 9 p. m. Buildings were demolished and large trees twisted off. This storm was of remarkable violence, and is considered the most severe ever experienced.

Reports concerning the very heavy rain storms of the 9th and 10th in the upper Ohio valley were considered in the preparation of the matter published elsewhere in this REVIEW under the heading "Floods."

WATER-SPOUTS.

Pensacola, Fla.: it is reported that a water-spout was observed over the Gulf at 10.55 a. m., 11th; it moved from north-west to southeast and lasted about twenty minutes.

Saint Augustine, Fla., 18th: about 1 p. m., 17th, a large water-spout was observed in the ocean opposite North Beach. At 3 p. m. it crossed the narrow sand spot of North Beach and entered the bay with a terrible rush and ominous roar, churning up the water in a terrible whirlpool. It came directly toward the town, and was much smaller than when first observed. It crossed the town going southwest, and crushed in several buildings; its passage being followed by torrents of rain.—*The (Oswego, N. Y.) Palladium.*

On the evening of the 17th a water-spout burst near Purcell Station on the banks of the river Duckee, Ind., covering the railroad tracks and surrounding country with two feet of water. A passenger train was derailed.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

Arkansas River.—Dodge City, Kans., 14th: the water in the river at this place is from one to two feet wide and some inches deep, being the lowest stage of water observed here for many years; the river is entirely dry a few miles below this city.

Cumberland River.—Nashville, Tenn., 28th: the navigation of the season is at a stand still on account of low water; the past season has been an unusually short one; a great deal of freight is waiting transportation on the upper Cumberland, which cannot be brought down until after the autumn rise.

Tennessee River.—Chattanooga, Tenn.: on account of low water navigation was closed to all vessels on the 28th.

In the following table are shown the danger-points at the various stations, the highest and lowest depths for July, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, July, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	8 to 11	20.2	31	14.4	6.8
Arkansas River:						
Fort Smith, Ark.	22.0	1	9.0	24	2.5	6.5
Little Rock, Ark.	23.0	1	13.1	26, 27	4.3	8.8
Missouri River:						
Kansas City, Mo.	24.0	2, 3	20.4	31	12.1	8.3
Omaha, Nebr.	18.0	1	16.1	31	9.9	6.2
Leavenworth, Kans.	20.0	3	18.2	31	11.7	6.5
Mississippi River:						
Saint Paul, Minn.	14.5	1	7.8	30	4.7	3.1
La Crosse, Wis.	24.0	1	9.9	31	5.9	4.0
Dubuque, Iowa.	16.0	1	12.1	31	6.4	5.7
Davenport, Iowa.	15.0	1	9.5	31	4.5	5.0
Keokuk, Iowa.	14.0	9, 10	10.1	31	5.1	5.0
Saint Louis, Mo.	32.0	1	27.1	31	16.4	10.7
St. Louis, Ill.	40.0	19, 20	28.7	31	17.3	11.4
Memphis, Tenn.	34.0	22	23.6	31	15.2	8.4
Vicksburg, Miss.	41.0	10, 11	30.0	31	25.5	4.5
New Orleans, La.	13.0	1 to 3	10.4	31	8.1	2.3
Ohio River:						
Pittsburg, Pa.	22.0	11	22.0	28	1.6	20.4
Cincinnati, Ohio.	50.0	15	31.5	4	7.4	24.1
Louisville, Ky.	25.0	16	11.3	1, 5, 6	4.6	6.7
Cumberland River:						
Nashville, Tenn.	40.0	1	13.3	31	2.1	11.2
Tennessee River:						
Chattanooga, Tenn.	33.0	1	7.1	29	1.8	5.3
Savannah River:						
Augusta, Ga.	32.0	31	9.3	16	6.3	3.5
Willamette River:						
Portland, Oregon.	1	14.6	31	7.0	7.6

FLOODS.

A destructive flood, resulting from the heavy rains of the 8th, 9th, and 10th, occurred along the valley of the Monongahela River, and the rivers of western Pennsylvania and West Virginia were swollen into torrents. At Grafton the rise was unprecedented, and the lumber interests suffered severely, the loss to the town and section being estimated at \$250,000. The damage at Rowlesburg was also heavy. Advices from Wheeling, W. Va., state that the freshet was the greatest ever known in that section, and that the destruction to property was beyond computation. The Signal Service observer at Pittsburg reports "that owing to the heavy rains in the Monongahela Valley the Monongahela River rose at the rate of nine inches per hour throughout the day of the 10th, carrying destruction along its shores from the headwaters to the mouth of the river. At points above Pittsburg the river was higher than ever before, reaching forty-three feet at Greensborough, Penn., on the 11th. The damage done by the overflow at Pittsburg during the 10th and 11th is estimated at \$300,000. The river began to fall on the 12th." At Parkersburg, W. Va., the Kanawha River rose thirteen feet on the 10th, washing away one bridge. The following total rainfalls, in inches, from the 8th to the 10th, inclusive, have been reported from stations in Pennsylvania: Pittsburg, 1.60; Uniontown, 2.43; Indiana, 3.56; Somerset, 2.00; Charlesville, 1.56; Huntingdon, 1.62. From the 7th to the 10th the precipitation at Parkersburg, W. Va., amounted to 7.32 inches, and at Columbus, Ohio, 3.24 inches fell during the 8th and 9th. The heavy rains of the 9th and 10th were also very destructive in central and southern Illinois, and in portions of eastern Indiana, causing great damage to crops. A terrific rain storm or cloud-burst occurred at Wheeling, W. Va., on the evening of the 19th. Many lives were lost; houses were wrecked; bridges carried away, and great damage done to property. Reports from all parts of Ohio county, W. Va., indicate that the storm was very disastrous to life and property. At Triadelphia it was particularly severe. Over a considerable part of Belmont county, Ohio, the damage to fruit and crops was very great.

During the afternoon of the 1st a heavy rain storm of short duration visited Deadwood, Dak., and vicinity, causing floods in the gulches and valleys, and doing considerable damage to property, live stock, and crops.

HIGH TIDE.

Galveston, Tex., 5th.

ATMOSPHERIC ELECTRICITY.

THUNDER-STORMS.

From the accompanying table it will be seen that thunder-storms were reported from the largest number (thirty-four) of

states and territories on the 5th, and nearly as many (32) occurred on the 27th and 30th, respectively. They were least extensively reported on the 15th, on which date they occurred

in but fourteen states and territories; the 1st, 12th to 14th, having each almost the same number as the 15th.

In Dakota, Florida, Illinois, Iowa, Minnesota, Nebraska, and Texas thunder-storms occurred on from twenty-five to thirty days during the month; Florida reporting the maximum

number of dates. They occurred on six days, or less, in Connecticut, District of Columbia, Idaho, Kentucky, Maryland, Nevada, New Hampshire, and Washington Territory; Idaho reporting the least. There was no state or territory in which they did not occur:

Table showing the number of stations in the several states and territories reporting thunder-storms for each day during July, 1888.

State or Territory.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total	
Alabama.....		1	1	1	1	3	2		2	2	1				1		1		2		1		1		2	2		1	2	2	29		
Arizona.....			1	1		1				2	3		3	3	3	4	6	5	2	2	2	1	4	1	6	3	4	1	7	6	5	85	
Arkansas.....		2	2	1	3	3		2	3							3	2	2	1	1	1	1	1	1	1	1	2	2	2	1	32		
California.....		1		1							3					1	3	3	1	1	1	2	2	3	2	1	3	1	1	1	37		
Colorado.....				1			3	2						1	3	1	2			2	1	2	2	3	2	1	3	1	1	2	13		
Connecticut.....					4							1								2	2	1	1	1	1	2	2	2	3	7	111		
Dakota.....	9	2	5	5	3	2	9	2					9	1	6	1	1			7	3	7	1	3	6	5	3	7	5	7	2	4	
District of Columbia.....				1		1	1	1												3	5	5	4	3	4	4	4	3	4	3	1	98	
Florida.....	3	6	5	1	2	1		2	3	2	3	4	1	2	7	7	2	1	3	3	2	1	1	4	5	4	4	5	4	3	1	59	
Georgia.....				4	3	1	2	3	3	2	1	1	2	2						2	2	1	1	4	5	4	4	5	4	3	2	2	
Idaho.....																																2	
Illinois.....		3	26	29	5	4	15	37	12	2			1	10		6	6	2	1		2	14	1		10	20	11	12	4	3	16	252	
Indiana.....				4			4	3	2								1				1	1	3									2	
Indiana Territory.....					1	2		3									2	2	2	1												13	
Iowa.....		2	20	24	5	4	17	14	1				8	7		11	2	1	1	1	16	2	1	4	7	9	4	1	3	1	8	174	
Kansas.....		1	2	1	2	3	2	13	6				3	6	6	13	2	1		1		4	7	5	2	1	3	2				87	
Kentucky.....				1			2	2									1															9	
Louisiana.....	4	3	3	2	4	2	3	4	4	2	1			1	2	4	6	2	3						2	1	7	3	1	1	1	18	
Maine.....					1		2				4	1																				4	
Maryland.....																																41	
Massachusetts.....	1				8						10	2								3		1	8	2	1				5			150	
Michigan.....		2	16	9	3	14	7	14	5	4	3	8					1	8			2	16	3			7						131	
Minnesota.....	11	9	5	3	4	7	10	1	2	4	2	1	1	3		2	6			1	6	8	1			5	1	6	8	12	3	16	
Mississippi.....	1		1	1	1	2			2	2	1																					18	
Missouri.....							1	2	1							3																39	
Montana.....	2		1		1	4	2	1					5	1	2	1				1	1	1			2	2	6	2	2	1	1	69	
Nebraska.....	1	2	4	3	1		4	6	2				5	2	2	5	2				5	4	5	1	4	1	7					5	
Nevada.....																																12	
New Hampshire.....							1													1	2											30	
New Jersey.....	1		1	1	4		3				5	1	1							3	2					1	4	1		3	1	34	
New Mexico.....	2	1			1								1	2	1	1				1	2	1	5	4	2	1						68	
New York.....				3	12		1	1	1	1	13	1								7	12	2	2		1							36	
North Carolina.....	2			3	3		1	3	1	5			1	2																		7	
Ohio.....				11	5	1	10	11	3		8	3								2	5	2	1	1	7	11						14	
Oregon.....																																17	
Pennsylvania.....			1	6	20	1	2	8	3	1	3	12								2	2	1	1									47	
South Carolina.....	1	1		3	1		5	6	8		1																					121	
Tennessee.....		1	4	8	10	2	8	5	12				2	1	1				2	2	3	3			1	4	7	8	7	10	10	9	72
Texas.....	5	3	3	6	4	3	5	3	2	4	1	1	2		1	2	4	4	4		1	2	1	1	2							11	
Utah.....																																31	
Vermont.....					1		2													1	2											41	
Virginia.....	1	1	1	2	6	1	1	5	5	1	1	1	3	1					1	1	1		1	3								3	
Washington.....																																31	
West Virginia.....				3	5		5	4	3	1		1	1						1	1	3											6	9
Wisconsin.....		1	7	3		11	1	6													6	8				1	3						44
Wyoming.....	5			3	2	4	4													2		1	3	3	5	2	3	1					
Number of States reporting.....	15	18	21	25	34	24	28	30	27	16	24	17	17	15	14	21	25	20	20	29	18	25	23	27	21	23	32	29	23	32	29		

AURORAS.

Auroras were observed on but few dates during July, all of which were very faint and confined to small sections of the country.

Auroras were observed during the month as follows: 1st,

Alpena, Mich.; Lyons and Oswego, N. Y. 7th, Gardiner, Me. 16th, Burlington, Vt. 17th, Oswego, N. Y. 22d, Newburyport, Mass. (suspected). 28th, Gardiner, Me.; Lyons, N. Y.; Burlington, Vt. 29th, Webster, Dak.; Gardiner, Me. 13th.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Lead Hill, Boone Co., Ark.: the month has been very warm and dry, and crops are suffering severely from drought.

Fort Apache, Ariz.: the drought which had continued uninterrupted for sixty days was broken by light rain on the 6th, and frequent rains occurred after that date throughout the month.

Yankton, Dak., 13th: the protracted drought in this vicinity has caused some damage to small grain; the drought was broken by the heavy rains on this date.

Augusta, Ga.: the prevailing dry weather during the first nineteen days of the month caused serious apprehension of a total failure of corn and other crops; the drought was broken by showers on the 20th.

Salina, Saline Co., Kans.: the unusually hot and dry winds during the last ten days of the month have reduced the corn crop about 40 per cent., and creeks and wells are running short of water. A similar period of heated winds has not occurred since 1874.

Cunningham, Kingman Co., Kans.: the hot and dry weather during the last ten days of the month has affected the crops

very seriously in counties south of this place; the drought has been still more severe, and farmers are cutting up thin corn for fodder.

Yates Centre, Woodson Co., Kans.: the month has been unusually dry, corn is much damaged, pastures are drying up, and water for stock is scarce.

Lamar, Mo., 4th: the drought in this section is doing serious damage to corn. Rain fell on the 8th, breaking the drought. It was reported on the 26th that stock and crops were suffering from drought.

Springfield, Mo., 26th: the protracted drought of the past fifteen days has been very injurious to crops.

Thornville, Lapeer Co., Mich.: the month has been very dry; corn, potatoes, and young clover have suffered most from the drought.

Wytheville, Wythe Co., Va., 31st: a drought has continued for the last two months, and though light rains have fallen at intervals, they have not been sufficient to break it, and all kinds of vegetation have suffered in consequence.

FOREST AND PRAIRIE FIRES.

Coral, Montcalm Co., Mich., 19th: fires in the woods during